

WHAT IS CLAIMED IS:

1. An exhaust-gas cleaning device for an engine, said exhaust-gas cleaning device comprising:

an HC-adsorbing catalytic converter disposed in an exhaust passage, the HC-adsorbing catalytic converter including:

an HC-adsorbing material which adsorbs HC contained in exhaust gas and releases adsorbed HC as temperature increases;

an oxygen storage material which occludes oxygen when the concentration of oxygen in the exhaust gas is high and releases occluded oxygen as the oxygen concentration drops; and

an oxidizing catalytic metal which oxidizes HC released from the HC-adsorbing material; and

an oxygen concentration controller which controls the oxygen concentration in the exhaust gas on the upstream side of the HC-adsorbing catalytic converter in such a manner that oxygen is released from the oxygen storage material when the engine is in an operating condition in which HC is released from the HC-adsorbing material.

2. The exhaust-gas cleaning device according to claim 1, wherein the oxygen concentration controller controls the engine in such a manner that the oxygen concentration in

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the exhaust gas on the upstream side of the HC-adsorbing catalytic converter becomes equal to or less than 0.3% when the engine is in the operating condition in which HC is released from the HC-adsorbing material.

3. The exhaust-gas cleaning device according to claim 1, the oxygen concentration controller including an air-fuel ratio controller for controlling average air-fuel ratio in a combustion chamber of the engine, wherein the air-fuel ratio controller controls the engine in such a manner that a value corresponding to the ratio between the oxygen concentration and the concentration of a reducing agent contained in the exhaust gas flowing into the HC-adsorbing catalytic converter becomes appropriate for creating an exhaust gas atmosphere which is obtained by burning a mixture at an average air-fuel ratio of 14.7 or less in the combustion chamber so that oxygen is released from the oxygen storage material when the engine is in the operating condition in which HC is released from the HC-adsorbing material.

4. The exhaust-gas cleaning device according to claim 1, the oxygen concentration controller including an air-fuel ratio controller for controlling average air-fuel ratio in a combustion chamber of the engine, wherein the

air-fuel ratio controller controls the engine in such a manner that a value corresponding to the ratio between the oxygen concentration and the concentration of a reducing agent contained in the exhaust gas flowing into the HC-adsorbing catalytic converter becomes appropriate for creating an exhaust gas atmosphere which is obtained by burning a mixture at an average air-fuel ratio between 13.5 and 14.5 in the combustion chamber so that oxygen is released from the oxygen storage material when the engine is in the operating condition in which HC is released from the HC-adsorbing material.

5. The exhaust-gas cleaning device according to any one of claims 1 through 4, wherein the oxygen concentration controller controls the engine in such a manner that the oxygen concentration in the exhaust gas on the upstream side of the HC-adsorbing catalytic converter matches a set value without becoming alternately higher and lower than the set value.

6. The exhaust-gas cleaning device according to claim 3 or claim 4, wherein the air-fuel ratio controller performs feedback control operation for making the average air-fuel ratio in the combustion chamber alternately higher and lower than a set air-fuel ratio based on the oxygen

concentration in the exhaust gas on the upstream side of the HC-adsorbing catalytic converter, and wherein feedback control gain for air-fuel ratio control operation performed by the air-fuel ratio controller is set to a small value when the engine is in the operating condition in which HC is released from the HC-adsorbing material than when the engine is in an operating condition in which releasing of HC from the HC-adsorbing material has finished.

7. The exhaust-gas cleaning device according to any one of claims 1 through 4, wherein the HC-adsorbing material is disposed on a carrier of the HC-adsorbing catalytic converter and an oxidizing catalyst layer is formed on the outside of the HC-adsorbing material.

8. The exhaust-gas cleaning device according to claim 7, wherein the oxygen storage material is contained in the oxidizing catalyst layer.

9. An exhaust-gas cleaning device for an engine, said exhaust-gas cleaning device comprising:

an HC-adsorbing catalytic converter disposed in an exhaust passage, the HC-adsorbing catalytic converter including:

an HC-adsorbing material which adsorbs HC contained

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in exhaust gas and releases adsorbed HC as temperature increases;

an oxygen storage material which occludes oxygen when the concentration of oxygen in the exhaust gas is high and releases occluded oxygen as the oxygen concentration drops; and

an oxidizing catalytic metal which oxidizes HC released from the HC-adsorbing material; and

an oxygen concentration controller which controls the oxygen concentration in the exhaust gas on the upstream side of the HC-adsorbing catalytic converter in such a manner that oxygen is released from the oxygen storage material when the engine is in an operating condition in which HC is released from the HC-adsorbing material, and the oxygen concentration controller including:

an air-fuel ratio controller for controlling average air-fuel ratio in a combustion chamber of the engine, wherein the air-fuel ratio controller controls the engine in such a manner that a value corresponding to the ratio between the oxygen concentration and the concentration of a reducing agent contained in the exhaust gas flowing into the HC-adsorbing catalytic converter becomes appropriate for creating an exhaust gas atmosphere which is obtained by burning a mixture at an average air-fuel ratio of 14.7 or less in the

combustion chamber so that oxygen is released from the oxygen storage material when the engine is in the operating condition in which HC is released from the HC-adsorbing material and

the air-fuel ratio controller performs feedback control operation for making the average air-fuel ratio in the combustion chamber alternately higher and lower than a set air-fuel ratio based on the oxygen concentration in the exhaust gas on the upstream side of the HC-adsorbing catalytic converter, and wherein feedback control gain for air-fuel ratio control operation performed by the air-fuel ratio controller is set to a small value when the engine is in the operating condition in which HC is released from the HC-adsorbing material than when the engine is in an operating condition in which releasing of HC from the HC-adsorbing material has finished.

10. An exhaust-gas cleaning device for an engine, said exhaust-gas cleaning device comprising:

HC-adsorbing catalytic converting means disposed in an exhaust passage, the HC-adsorbing catalytic converting means including:

an HC-adsorbing material which adsorbs HC contained in exhaust gas and releases adsorbed HC as

temperature increases;

an oxygen storage material which occludes oxygen when the concentration of oxygen in the exhaust gas is high and releases occluded oxygen as the oxygen concentration drops; and

an oxidizing catalytic metal which oxidizes HC released from the HC-adsorbing material; and

an oxygen concentration controlling means for controlling the oxygen concentration in the exhaust gas on the upstream side of the HC-adsorbing catalytic converter in such a manner that oxygen is released from the oxygen storage material when the engine is in an operating condition in which HC is released from the HC-adsorbing material and the oxygen concentration controlling means controls the engine in such a manner that the oxygen concentration in the exhaust gas on the upstream side of the HC-adsorbing catalytic converting means becomes equal to or less than 0.3% when the engine is in the operating condition in which HC is released from the HC-adsorbing material.